User's Manual

Model HXS10
Application Specific Controller

SolStation™

IM 25G10B01-01EN

YOKOGAWA
Yokogawa Electric Corporation

6th Edition : Jun. 2013

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Introduction

Thank you for purchasing the HXS10 Application Specific Controller.
This user's manual describes the basic operations of the HXS10. The guide should be provided to the end user of this product.
Be sure to read this user's manual before using the product in order to ensure correct operation.
For details of this product, refer to the electronic manual.
Before using the product, refer to the table of Model and Suffix Codes to make sure that the delivered product is consistent with the model and suffix codes you ordered. Also make sure that the following items are included in the package.

•HXS10.....x1
•User's Manual (this document).....x1 (A3 size)

● Target Readers

This guide is intended for the following personnel;
- Engineers responsible for installation, wiring, and maintenance of the equipment
- Personnel responsible for normal daily operation of the equipment.

1. Safety Precautions

The following symbol is used on the instrument. It indicates the possibility of injury to the user or damage to the instrument, and signifies that the user must refer to the user's manual for special instructions. The same symbol is used in the user's manual on pages that the user needs to refer to, together with the term "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.

CAUTION

Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.

⎓ DC

⏚ Functional grounding terminals (Do not use this terminal as a protective grounding terminal).

Note

Identifies important information required to operate the instrument.

Warning and Disclaimer

(1) YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
(2) The product is provided on an "as is" basis. YOKOGAWA, and any third party who makes the software for HXS10 assume no liability to any person or entity for any loss or damage, direct or indirect, arising from the use of the product or from any unpredictable defect of the product.

Safety, Protection, and Modification of the Product

(1) In order to protect the system controlled by this product and the product itself, and to ensure safe operation, observe the safety precautions described in the user's manual. Use of the instrument in a manner not prescribed herein may compromise the product's functions and the protection features inherent in the device. We assume no liability for safety, or responsibility for the product's quality, performance or functionality should users fail to observe these instructions when operating the product.
(2) Installation of protection and/or safety circuits with respect to a lightning protector; protective equipment for the system controlled by the product and the product itself; foolproof or failsafe design of a process or line using the system controlled by the product or the product itself; and/or the design and installation of other protective and safety circuits are to be appropriately implemented as the customer deems necessary.
(3) Be sure to use the spare parts approved by YOKOGAWA when replacing parts or consumables.
(4) This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
(5) Modification of the product is strictly prohibited.

WARNING

- **Power Supply**
  Ensure that the instrument's supply voltage matches the voltage of the power supply before turning ON the power.
- **Do Not Use in an Explosive Atmosphere**
  Do not operate the instrument in locations with combustible or explosive gases or steam. Operation in such environments constitutes an extreme safety hazard. Use of the instrument in environments with high concentrations of corrosive gas (H_2S, SO_x, etc.) for extended periods of time may cause a failure.
- **Do Not Remove Internal Unit**
  The internal unit should not be removed by anyone other than YOKOGAWA's service personnel. There are dangerous high voltage parts inside. Additionally, do not replace the fuse by yourself.
- **Use a soft dry cloth to clean the instrument. Do not use organic solvents, such as benzene or thinner, or other cleansers. They may cause discoloring and deformation.**
- **Damage to the Protective Construction**
  Operation of the instrument in a manner not specified in the user's manual may damage its protective construction.

CAUTION

This instrument is an EMC class A product. In a domestic environment this product may cause radio interference in which case the user needs to take adequate measures.

2. Model and Suffix Codes

HXS10

[Style:S1]

Model	Suffix code				Optional suffix code	Description
HXS10						Application specific controller
Analog input	-0					None
	-2					2 channels
	-4					4 channels
	-6					6 channels
Language		-1				Japanese
		-2				English
Application			-01			for Solar tracking
			-02			for Solar tracking (Extended Memory)
Fixed code				-00		Always "00"
Options					/AA	Analog output (2ch)
					/C2	RS-232 communication
					/C3	RS-485 communication
					/PC	Pulse counter input (2 channels)

Accessories (sold separately)

The following is an accessory sold separately.
• HXSS10 Setting software for HXS10

Model	Suffix code	Description
HXSS10	-0-0	Setting software for HXS10

• HXSS10 User's manual, setting software for HXS10 (A4 size)
Note: User's Manual can be downloaded from a website.

• HXSS90 Proprietary cable for HXS10

Model	Description
HXSS90	Proprietary cable for HXS10 (A1059UR)

HXSS90 Proprietary cable for HXS10 comes with the package of HXSS10 Setting Software for HXS10.

Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC

This is an explanation of how to dispose of this product based on Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC. This directive is only valid in the EU.

Marking

This product complies with the WEEE Directive (2002/96/EC) marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product.
Do not dispose in domestic household waste. When disposing products in the EU, contact your local Yokogawa Europe B.V. office.

3. How to Install

The instrument should be installed in locations meeting the following conditions:
- **Locations with little mechanical vibration**
  Install the instrument in a location subject to little mechanical vibration.
- **Vertical and horizontal location**
  Mount the instrument vertically and horizontally and ensure that it is level, with no inclination to the right or left. Install it so that the power terminals face downward.
- **Widely-spaced location**
  This instrument should be well spaced out as shown in the mounting dimensions.
- **Wall on which to mount the instrument**
  The wall on which to mount the instrument should be made of metal with sufficient strength.

Note

If the instrument is moved from a location with low temperature and low humidity to a place with high temperature and high humidity, or if the temperature changes rapidly, condensation will result. Moreover, in the case of thermocouple inputs, measurement errors will result. To avoid such a situation, leave the instrument in the new environment under ambient conditions for more than 1 hour prior to using it.

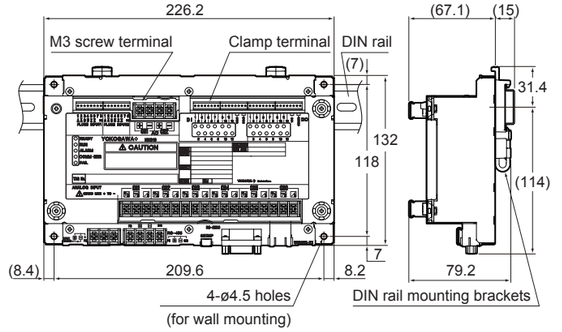
Do not mount the instrument in the following locations:
- **Outdoor environments**
  For outdoor use, use the HXS10 inside the NEMA 4 enclosure or better and protect the HXS10 from the direct sunlight. Make sure the temperature inside the enclosure is within the normal operating range.
- **Locations with substantial amounts of oily fumes, steam, moisture, dust, or corrosive gases**
  The presence of oily fumes, steam, moisture, dust, or corrosive gases adversely affects the instrument. Do not mount the instrument in locations subject to any of these substances.
- **Areas near electromagnetic field generating sources**
  Do not place magnets or tools that generate magnetism near the instrument. If the instrument is used in locations close to a strong electromagnetic field generating source, the magnetic field may cause measurement errors.
- **Locations just above the high-heat-generating equipment.**
- **Areas close to flammable articles**
  Absolutely do not place the instrument directly on flammable surfaces. If such a circumstance is unavoidable and the instrument must be placed close to a flammable item, provide a shield for it made of 1.43 mm thick plated steel or 1.6 mm thick unplated steel with a space of at least 150 mm between it and the instrument on the top, bottom, and sides.
- **Areas subject to being splashed with water**

WARNING

- **Be sure to turn OFF the power supply to the controller before installing it on the panel to avoid an electric shock.**
- **The instrument may become hot depending on the ambient temperature. Install it such that it cannot be touched easily.**

External dimensions

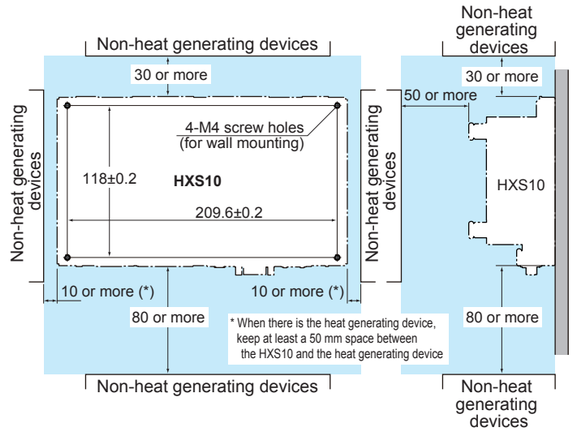
unit: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Mounting dimension diagram

Unit: mm



Notes on Using HXSS10 of R1.01.01 (Old Version)

Old versions of software cannot be used with the HXS10 of release code R2.01 (new model).
Please download HXSS10 of R2.01.01 (new version) from the Yokogawa's website at:
< http://www.yokogawa.com/ns/hxs/download/ >

- **User programs and parameters that were created with an old version can be opened from the new version(R2.01.01). They can be downloaded to both the HXS10 (old model) and new model from the new version of software.**
- **User programs and parameters that were uploaded from the new model cannot be downloaded to an old model. Please be careful not to overwrite the .HSS file for the old model with a file of the same name.**
- **To create new user programs and parameters for an old model with the new version of software, change the parameter version (PARA) and compile version (COMP) to "R1.01.01" in the System Data window. Alternatively, upload the system data from the old model. Files created when PARA and COMP is "R2.01.01" cannot be downloaded to the old model.**

*** The release code is on the nameplate of the HXS.**

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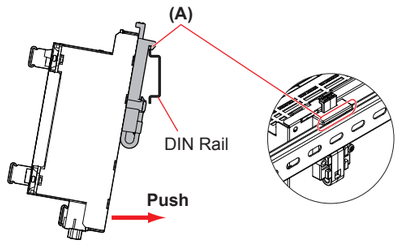
DIN rail mounting

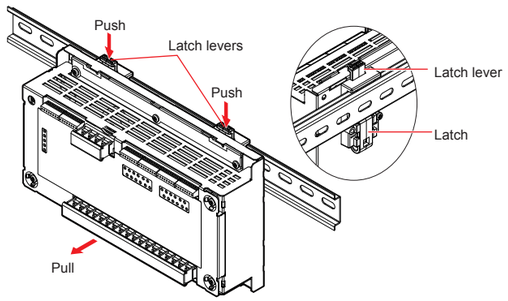
Mounting to DIN rail

Hook areas (A) of the DIN rail mounting brackets (right and left) on a DIN rail and push the HXS10 forward.



Removing from DIN rail

While pressing the latch levers downward, pull the HXS10 toward you to release it from the rail.

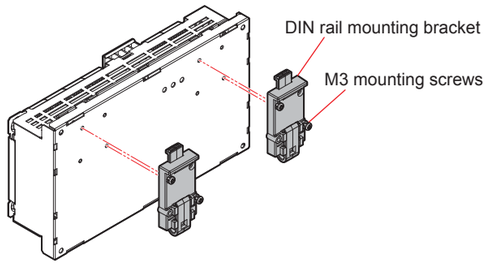


Wall mounting

Remove the DIN rail mounting brackets from the rear of the HXS10 and then mount the HXS10 to the wall surface using four M4 screws.

Removing the DIN rail mounting brackets

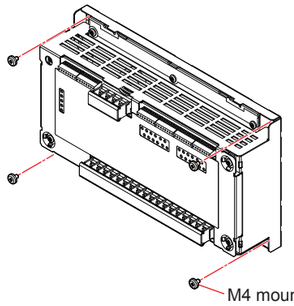
The DIN rail mounting brackets can be removed from the instrument by unscrewing the M3 mounting screws (two places each) as shown below.



To attach the DIN rail brackets to the instrument, fasten them with M3 mounting screws (two places each) as shown above. (Tightening torque: 0.6N·m)

Mounting to the wall

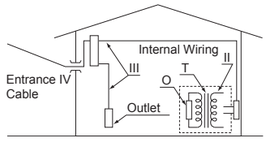
Fix the instrument to the wall with four M4 screws.



4. Hardware Specifications

WARNING

This instrument is designed to measure circuits that are not directly connected to the mains. Do not use it for measurements that fall under Measurement Category II, III, or IV.



Category	Measurement category	Description	Remarks
II	CAT.II	For measurements performed on circuits directly connected to the low-voltage installation.	Appliances, portable equipments, etc.
III	CAT.III	For measurements performed in the building installation.	Distribution board, circuit breaker, etc.
IV	CAT.IV	For measurements performed at the source of the low-voltage installation.	Overhead wire, cable systems, etc.

Input/Output Specifications

● Analog Input (AI)

- Number of Universal Inputs: Max. 6 (M3 screw terminal)
- Input range: -5% to 105% (The guaranteed accuracy range is 0% to 100%.)
- Input type, instrument range, and measurement accuracy: See the table below,

Input Type		Range name (Range code)	Measurable range		Accuracy
DC voltage	20 mV	20 mV (0)	–20.000 to 20.000 mV		±0.05% of instrument range ±1 μV
	60 mV	60 mV (1)	–60.00 to 60.00 mV		±0.05% of instrument range ±10 μV
	200 mV	200 mV (2)	–200.00 to 200.00 mV		
	1 V	1 V (3)	–1.0000 to 1.0000 V		±0.05% of instrument range ±0.1 mV
	2 V	2 V (4)	–2.0000 to 2.0000 V		
	6 V	6 V (5)	–6.000 to 6.000 V		±0.05% of instrument range ±1 mV
	0-10 V	0-10 V (6)	0.000 to 10.000 V		±0.1% of instrument range ±1 mV
	20 V	20 V (7)	–20.000 to 20.000 V		±0.05% of instrument range ±1 mV
Standard signal	0.4-2 V	0.4-2 V (8)	0.4000 to 2.0000 V		±0.1% of instrument range ±0.1 mV
	1-5 V	1-5 (9)	1.000 to 5.000 V		±0.1% of instrument range ±1 mV
Thermocouple (*1)	K	K1 (10)	–270.0 to 370.0°C	–450.0 to 2500.0°F	± 0.1% of instrument range ± 0.1°C for 0°C or more
		K2 (11)	–200.0 to 500.0°C	–200.0 to 1000.0°F	± 0.2% of instrument range ± 0.1°C for less than 0°C
	J	J (12)	–200.0 to 1100.0°C	–300.0 to 2000.0°F	± 2% of instrument range ± 0.1°C for less than -200°C of thermocouple K, T.
	T	T (13)	–270.0 to 400.0°C	–450.0 to 750.0°F	
	B	B (14)	0.0 to 1800.0°C	32 to 3300°F	± 0.15% of instrument range ± 0.1°C for 400°C or more
					± 5% of instrument range ± 0.1°C for less than 400°C
	S	S (15)	0.0 to 1700.0°C	32 to 3100°F	± 0.15% of instrument range ± 0.1°C
	R	R (16)	0.0 to 1700.0°C	32 to 3100°F	
	N	N (17)	–200.0 to 1300.0°C	–300.0 to 2400.0°F	± 0.1% of instrument range ± 0.1°C for 0°C or more
					± 0.25% of instrument range ± 0.1°C for less than 0°C
	E	E (18)	–270.0 to 800.0°C	–450.0 to 1450.0°F	± 0.1% of instrument range ±0.1°C for 0°C or more
	L	L (19)	–200.0 to 900.0°C	–300.0 to 1600.0°F	± 0.2% of instrument range ± 0.1°C for less than 0°C
	U	U (20)	–200.0 to 400.0°C	–300.0 to 750.0°F	± 1.5% of instrument range ± 0.1°C for less than -200°C of thermocouple E
	W	W (21)	0.0 to 2300.0°C	32 to 4200°F	± 0.2% of instrument range ± 0.1°C
	Platinel 2	PL2 (22)	0.0 to 1390.0°C	32.0 to 2500.0°F	± 0.1% of instrument range ± 0.1°C
	PR20-40	P2040 (23)	0.0 to 1900.0°C	32 to 3400°F	± 0.5% of instrument range ± 0.1°C for 800°C or more Accuracy is not guaranteed for less than 800°C
	W97Re3-W75Re25	WRe (24)	0.0 to 2000.0°C	32 to 3600°F	± 0.2% of instrument range ±0.1°C
RTD	JPt100	JPT1 (25)	–200.0 to 500.0°C	–300.0 to 1000.0°F	± 0.1% of instrument range ± 0.1°C (*2)
		JPT2 (26)	–150.00 to 150.00°C	–200.0 to 300.0°F	± 0.1% of instrument range ± 0.1°C
	Pt100	PT1 (27)	–200.0 to 850.0°C	–300.0 to 1560.0°F	± 0.1% of instrument range ± 0.1°C (*2)
		PT2 (28)	–150.00 to 150.00°C	–200.0 to 300.0°F	± 0.1% of instrument range ± 0.1°C

K,J,T,B,S,R,N,E:IEC584-1(1995) DIN IEC584 JIS C1602-1995
U: Cu-CuNi,DIN43710, L:Fe-CuNi,DIN43710
W:W-5% Re/W-26% Re(Hoskins Mfg.Co.),ASTM E988
W97Re3-W75Re25: W-3%Re/W-25%Re (Hoskins Mfg. Co.)
Pt100:JIS C1604-1997 IEC751-1995 DIN IEC751-1996
JPt100:JIS C1604-1989 JIS C1606-1989 Measuring current i=1 mA

- The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power voltage at 24 VDC ±10%.

*1: Excluding reference junction compensation errors.
*2: ±0.4°C in the range between 0 and +100°C, ±0.6°C in the range between -100 to +200°C, ±0.8°C in the range between +200 to +500°C

Input sampling period	Synchronous with control period 100 ms or 250 ms (Analog Input 2 channels) 250 ms (Analog Input 4 channels or 6 channels)	
Burnout detection	• Functions at TC, RTD, and standard signal. • Detection ON/OFF switchable (settable for each channel) • Upscale, downscale, and off can be specified. • If "OFF" is specified, analog input value is undefined. • For standard signal, burnout is determined to have occurred if it is less than 0.1 V. • Detection time (max): 2 sec.	
Input bias current	10 nA or less (except the case of setting burnout detection)	
Measured current (RTD)	About 1 mA	
Input resistance	10 MΩ or more (for TC / DC voltage (1 V range or less)) About 1 MΩ (for DC voltage (2 V range or more) / standard signal)	
Allowable signal source resistance (Thermocouple, RTD and Standard signal)	2 kΩ or less	
	Effects of signal source resistance	±10 μV/1 kΩ or less (for TC / DC voltage (1 V range or less))
		±0.15%/1 kΩ or less (for DC voltage (2 V range or more) / standard signal)
Allowable wiring resistance (RTD)	RTD input: Max. 10 Ω/wire (The conductor resistance between three wires shall be equal.)	
	Wiring resistance effect: ±0.1°C/10 Ω (The conductor resistance between three wires shall be equal.)	
	The variation due to a difference in resistance between conductors, 40 mΩ (maximum difference between three wires), is approx. 0.1°C.	
Allowable input voltage	±10 V DC (for TC / DC voltage (1 V range or less) / RTD input) ±30 V DC (for DC voltage (2 V range or less) / standard signal)	
Noise rejection ratio (*1)	40 dB or more (at 50/60 Hz) (Normal mode) 120 dB or more (at 50/60 Hz) (Common mode)	
Maximum common mode noise voltage	250 V ACrms or less	
Maximum inter-channel noise voltage	250 V ACrms or less	
Reference junction compensation error	±1.5°C (15 to 35°C) ±2.0°C (-10 to 15°C and 35 to 50°C) ±2.5°C (-20 to -10°C and 50 to 70°C)	
Effect of ambient temperature	±0.01% of instrument range /°C	

*1: With digital filter set

● Analog Output (AO)

Number of outputs	2 (M3 screw terminal)
Output type	Current output: 4 to 20 mA DC or 0 to 20 mA DC
Load resistance	600 Ω or less
Output accuracy	±0.1% of span (±5% of span for 1 mA or less) The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH.
Effect of ambient temperature	±0.02% of F.S./°C or less

● Step Response Time

Step Response Time	Within 500 ms (for computation period 100 ms) (63% of analog output response time when a step change of 10 to 90% of input span is applied) Within 1.5 s (for computation period 250 ms) (63% of analog output response time when a step change of 10 to 90% of input span is applied)

● Digital Input (DI)

Number of inputs	12	
Input type	DC voltage input (used for sink and source), open collector or no-voltage contact input (External DI-driven power supply)	
Insulating	Photo-coupler isolation (internal circuit – input)	
Rated current (input)	About 1.4 mA /1 digital input	
Rated input voltage	24VDC -15%, +10%	
Input resistance	About 16.5 kΩ	
ON/OFF detection	Voltage input	On-voltage / On-current: 17 V DC or more / 1 mA or more
		Off-voltage / Off-current: 4 V DC or less / 250 μA or less
	Open collector input	Input voltage of 2 V DC or less is determined as "ON" and leakage current must not exceed 250 μA when "OFF."
	No-voltage contact input	Contact resistance of 1 kΩ or less is determined as "ON" and contact resistance of 100 kΩ or more as "OFF."
External connection	2.54 mm-pitch clamp terminal (recommended tightening torque: 0.12 – 0.15 N·m) Applicable wires: 0.14 to 0.5 mm^2 (AWG26 to AWG20) Stripped wire length: 4.5 mm	

● Pulse counter Input (Encoder Input)

Number of channels	2 channels
Input pulse method	Incremental encoder
Input pulse rate	10000 (pulse/s) (phase A/phase B (single multiplication)) 20000 (pulse/s) (phase A/phase B (double multiplication)) 40000 (pulse/s) (phase A/phase B (quad multiplication))
Corresponding encoder output	Complementary output (push/pull) / Differential output
Rated input voltage	24 V±20% (19.2 to 28.8 V : operating voltage range)
Rated input current	5 mA or less
On-voltage / On-current	14 V DC or more / 1.6 mA or more
Off-voltage / Off-current	2 V DC or more / 0.25 mA or more
External connection	2.54 mm-pitch clamp terminal (recommended tightening torque: 0.12 – 0.15 N·m) Applicable wires: 0.14 to 0.5 mm^2 (AWG26 to AWG20) Stripped wire length: 4.5 mm

● Digital Output (DO)

Number of outputs	12 (Note : DO12 is used for DO12 and FAIL output.)
Output type	Transistor contact output (SINK: Share a common wire with the external power supply)
Isolation method	Photo-coupler isolation (internal circuit – input)
Rated load voltage	Lower than the external power supply voltage
Maximum load current	100 mA / one DO
On-voltage	0.6 V DC or less
Leakage current at OFF	0.1 mA or less
External power supply	12 to 24 V DC (10.2 to 26.4 V DC) 20 mA or more
External connection	2.54 mm-pitch clamp terminal (recommended tightening torque: 0.12 – 0.15 N·m) Applicable wires: 0.14 to 0.5 mm^2 (AWG26 to AWG20) Stripped wire length: 4.5 mm

Communication Specifications

● Ethernet Communication

Communication standard	compliant with IEEE 802.3
Transmission type	10 BASE-T / 100 BASE-TX
Rate	10/100 Mbps (automatic)
Connector type	RJ-45
Segment	100 m max
Protocol	Modbus/TCP client, Modbus/TCP server, SNTP client and SNTP server

● Serial Communication (RS-232/RS-485)

Address setting (Setting Range)	1 to 247 (RS-485) , fixed 1 (RS-232) (Use the setting software)
Rate	1200/2400/4800/9600/19200/38400/57600/115200 bps
Communication method	Asynchronous communication method
Data length	8 bit
Start bit	1 bit
Stop bit	1 bit/2 bits
Parity	ODD/EVEN/NONE
Protocol	Modbus RTU master or Modbus RTU slave

RS-232	**Network topology**	1:1
	Modes of operation	full-duplex
	Hardware handshaking	none
	Connector type	DSUB-9pin
	Maximum distance	max. 15 m

RS-485	**Network Topology**	1:n multidrop, max. n=31
	Modes of operation	Half-duplex by using two wires
	Connector type	4 pole terminal
	Maximum distance	1.2 km max
	Terminating resistors	External (220 Ω, 1/4 W or more)

● Maintenance communication

Using the PC software, configuration parameter data, programming, F/W download can be realized through this port.

Number of ports	1
Connector	Micro-USB (Micro-B)
Cable	USB-TTL conversion cable (HXSS90)
Interface	Compliant with USB1.1
Supported Driver OS	Windows XP Professional (Service Pack2 or later) (32 bit version) Windows Vista Business (Service Pack1 or later) (32 bit version) Windows 7 Professional (32 bit version)

Safety and EMC Standards

IEC/EN61010-1, IEC/EN61010-2-030.

Installation category	I
Pollution degree	2
Measurement category	O
Rated measurement input voltage	±30 V DC max.
Rated transient overvoltage	1500 V (*)

* This is a reference safety value. This value is not necessarily a guarantee of instrument performance.

CE marking

EMC Directive
EN61326-1 Class A, Table2
EN61326-2-3
* The instrument continues to operate at a measurement accuracy of within ±10% of the range during testing.
EN55011 Class A Group1

EMC Regulatory Arrangement in Australia and New Zealand

EN55011 Class A Group1

KC marking

Electromagnetic wave interference prevention standard, electromagnetic wave protection standard compliance External Dimensions.

● Environmental resistance

Compliant with RoHS, WEEE

Construction, Installation, and Wiring

Dust-proof and drip-proof	IP20
Material	Steel plate (Case) Polyacetal resin (DIN rail mounting brackets)
Color	Light gray
Weight	About 1.0 kg
External dimensions (mm)	226×132× (67) (excluding DIN rail mounting brackets)
Installation	Wall mounting or DIN rail mounting For wall mounting, mount the instrument with four M4 screws.
Mounting direction	The product uses air cooling without blower. Install it with the front facing you and in the correct horizontal and vertical directions.

Power Supply Specifications and Isolation

• Power Supply Specifications

Rated voltage	24 V DC±10%
Power consumption	5 W or less
Power holdup time	1 ms or less

• Isolation

•Withstanding voltage

Among AI input channels	1000 V AC for 1 minute
Between analog input and internal circuits	1500 V AC for 1 minute
Between analog input and external circuits	1500 V AC for 1 minute
Between power supply and other circuits	1500 V AC for 1 minute
Between internal and external circuits	1000 V AC for 1 minute
Among other circuits	1000 V AC for 1 minute

Power supply (24 V DC)		Analog Input 1
Internal circuits	• RS232 communication • Maintenance communication • FG terminal	Analog Input 2
		Analog Input 3
		Analog Input 4
		Analog Input 5
		Analog Input 6
	External circuits	Analog Output 1 Analog Output 2
		Digital Input 1 to 12 External power supply
		Digital Output 1 to 12 External power supply
		RS485 communication (Except FG terminal)
		Pulse Counter Input 1 (Except FG terminal)
		Pulse Counter Input 2 (Except FG terminal)
		Ethernet communication

•Insulation resistance

Between FG terminal (internal circuit) and other circuits	20 MΩ or more (500 V DC)

Environmental Conditions

Item	Normal Operating Conditions	Transportation and Storage Conditions	Remarks
Ambient temperature	-20 to 70ºC	-25 to 70ºC	
Ambient humidity	20 to 90%RH	5 to 95%RH	(no condensation allowed)
Temperature change rate	10ºC/h or less	20ºC/h or less	
Continuous vibration	Half amplitude: 0.075 mm (frequency : 10 to 57 Hz) Acceleration: 9.8 m/s² (frequency : 57 to 150 Hz) Sweep cycle count in X, Y, and Z directions: 10 times		
Short-period vibration	14.7 m/s² 15 sec. or less		
Shock	Energized: 98 m/s² or less Non-energized: 147 m/s² or less Three times each in X, Y, and Z directions with half-sine shock pulse	When contained in external packing (blue box) 90 cm or less	Impact time 11 ms or less
Magnetic field	400 A/m or less		
Warm-up time	30 minutes or more after the power is turned on		
Toxic gas	Location free of corrosive gases		
Altitude	2000 m or less above sea level		

Note

The instrument uses an electrolytic capacitor, the life of which changes with ambient temperature. If the instrument is continuously used at 70ºC, the life of electrolytic capacitors is approx. 5.5 years. The life expectancy will be doubled for each 10ºC reduction in ambient temperature: if the instrument is used at 60ºC, the life of electrolytic capacitors is approx. 11 years.
If the instrument is used for a long period, it is recommended to keep the usage environment cool.
• The above descriptions do not guarantee the operation period of the instrument.

Others

Item	Specifications
Memory backup	The setup parameters and the clock
Lithium battery life	Approximately 10 years if not energized. (For use at room temperature. Not replaceable.)

* A power supply backs up during the power is ON. A built-in lithium battery backs up during the power is OFF.

5. How to Connect Wires

WARNING

- **Wiring work must be carried out by a person with basic electrical knowledge and practical experience. Since the instrument may be damaged, do not push the terminals too strongly in wiring. Attach them by force smaller than 50N.**
- **Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.**
- **As a safety measure, always install a circuit breaker (an IEC 60947-compatible product, 1 A, 24 V DC or more) in an easily accessible location near the instrument. Moreover, provide indication that the switch is a device for turning off the power to the instrument.**
- **Install the power cable keeping a distance of more than 1 cm from other signal wires.**
- **The power cable is required to meet the IEC standards concerned or the requirements of the area in which the instrument is being installed.**
- **Wiring should be installed to conform to NEC (National Electrical Code: ANSI/NFPA-70) or the wiring construction standards in countries or regions where wiring will be installed.**
- **For terminal connections, use heat-resistant cables.**
- **Do not apply voltages that exceed the allowed or rated value to the input or output terminals. Doing so may damage the instrument.**

CAUTION

- **Do not use an unassigned terminal as the relay terminal.**
- **Do not use a 100-240 V AC power supply for the 24 V DC model; otherwise, the instrument will malfunction.**
- **If there is a risk of external lightning surges, use a lightning arrester etc.**
- **For TC input, use shielded compensating lead wires for wiring and the terminal cover. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.**
- **After completing the wiring, the terminal cover is recommended to use for the instrument.**
- **The channel-to-channel negative terminals of analog output should not be used by shearing. Otherwise, the instrument will not operate properly.**

• Recommended Crimp-on Terminal Lugs

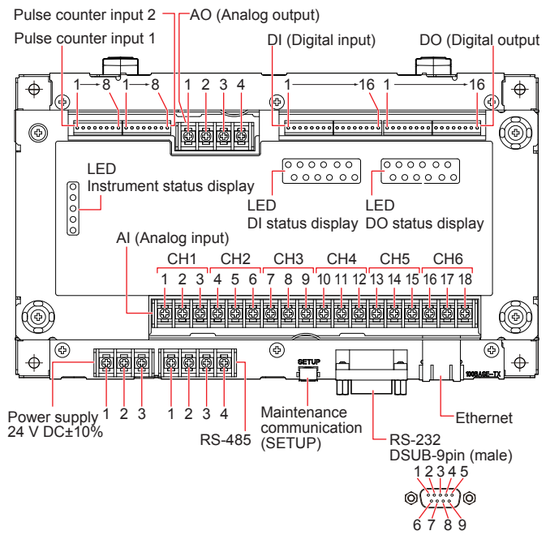
Recommended tightening torque: 0.6 N·m
Applicable wire size: Power supply wiring 1.25 mm² or more

Applicable terminal lug	Applicable wire size mm² (AWG#)	(φ d)	(A)	(F)
M3	0.25 to 1.65 (22 to 16)	3.3	5.5	4.2

• Cable Specifications and Recommended Cables

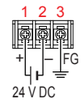
Purpose	Name and Manufacturer
Power supply	600 V Grade heat-resistant PVC insulated wires, JIS C3317(HIV), 0.9 to 2.0 mm²
Thermocouple	Shielded compensating lead wires, JIS C 1610
RTD	Shielded wires (three/four conductors), UL2482 (Hitachi Cable)
Other analog signals	Shielded wires
Contact input/output Pulse counter input	0.14 to 0.5 mm² (AWG26 to AWG20) , Stripped wire length: 4.5 mm
RS-485 communication	Shielded wires
Ethernet communication	100 BASE-TX (CAT-5) /10 BASE-T
Maintenance communication (SETUP)	HXSS90 Proprietary cable for HXS10

6. Terminal Arrangement and Wiring

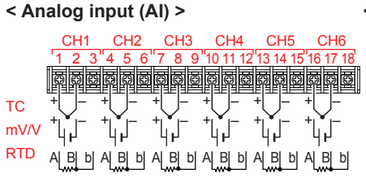


<Power supply>

Terminal No.	Function
1	24V DC +
2	24V DC –
3	FG



< Analog input (AI) >



Terminal No.	TC	mV / V	RTD	
1	CH1 (+)	CH1 (+)	CH1 (A)	
2	CH1 (–)	CH1 (–)	CH1 (B)	
3			CH1 (b)	(*1)
4	CH2 (+)	CH2 (+)	CH2 (A)	
5	CH2 (–)	CH2 (–)	CH2 (B)	
6			CH2 (b)	(*1)
7	CH3 (+)	CH3 (+)	CH3 (A)	
8	CH3 (–)	CH3 (–)	CH3 (B)	
9			CH3 (b)	(*1)
10	CH4 (+)	CH4 (+)	CH4 (A)	
11	CH4 (–)	CH4 (–)	CH4 (B)	
12			CH4 (b)	(*1)
13	CH5 (+)	CH5 (+)	CH5 (A)	
14	CH5 (–)	CH5 (–)	CH5 (B)	
15			CH5 (b)	(*1)
16	CH6 (+)	CH6 (+)	CH6 (A)	
17	CH6 (–)	CH6 (–)	CH6 (B)	
18			CH6 (b)	(*1)

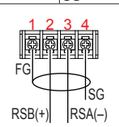
*1: RTD terminal b is shorted internally across all channels.

< Analog output (AO) >

Terminal No.	0-20 / 4-20 mA
1	CH1 (+)
2	CH1 (–)
3	CH2 (+)
4	CH2 (–)

< RS-485 >

Terminal No.	Function
1	FG
2	RSB (+)
3	RSA (–)
4	SG

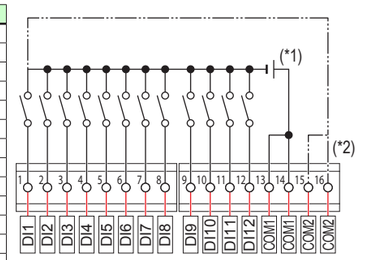


< RS-232 >

Terminal No.	Function
1	
2	RxD
3	TxD
4	
5	SG
6	
7	
8	
9	

< Digital input (DI) >

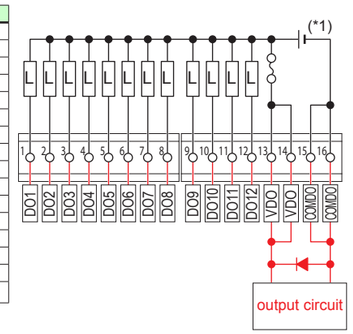
Terminal No.	Function
1	DI1
2	DI2
3	DI3
4	DI4
5	DI5
6	DI6
7	DI7
8	DI8
9	DI9
10	DI10
11	DI11
12	DI12
13	COM1 (for DI)
14	COM1 (for DI)
15	COM2 (for DI)
16	COM2 (for DI)



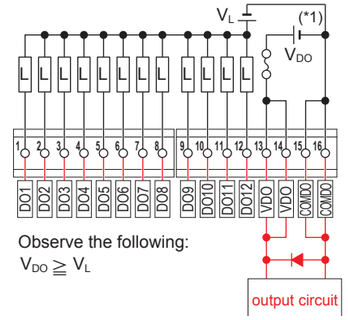
*1: Input power has no polarity.
*2: The instrument can operate even if no COM2 is connected.

< Digital output (DO) >

Terminal No.	Function
1	DO1
2	DO2
3	DO3
4	DO4
5	DO5
6	DO6
7	DO7
8	DO8
9	DO9
10	DO10
11	DO11
12	DO12
13	VDO
14	VDO
15	COMDO
16	COMDO



●When the load voltage is lower than the external power supply voltage



Observe the following:
$V_{DO} \geqq V_L$

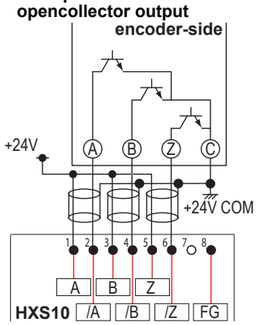
*1: Ensure the polarity of VDO and COMDO for the wiring.
In case of reverse connection, provide fuses to the external of the instruments to protect the output circuit from the overcurrent more than 100 mA.

< Pulse counter input (Encoder Input) 1, 2 >

Terminal No.	Function		
	Opencollector	Voltage	Differential
1	+24V	A	A
2	A	COMMON	/A
3	+24V	B	B
4	B	COMMON	/B
5	+24V	Z (R)	Z (R)
6	Z	COMMON	/Z (/R)
7			
8		FG	FG

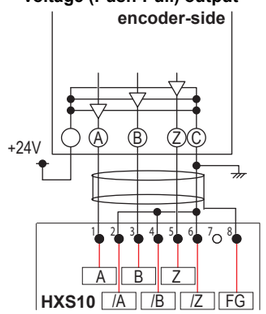
* In the case of an open collector type encoder, the calculation may not be normally performed by the capacity coupling between phase A and phase B.
When using, connect them separating each phase with shielded wires.
The shield must be connected to the common 24 V power supply for encoder input.

Example of connection to opencollector output

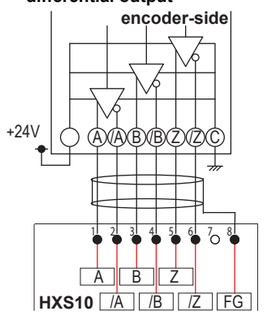


* Separate each phase using shielded wires, and connect to the common 24 V input.

Example of connection to voltage (Push-Pull) output



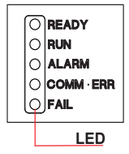
Example of connection to differential output



7. Status Display

Instrument status display

The instrument status is indicated using LEDs as follows:

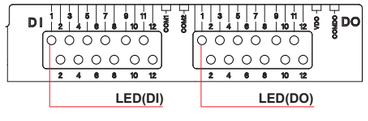


LED Name	LED Color	ON	OFF
READY	Green	Normal condition	Failure (*1) / Power OFF
RUN	Green	Under operation	Stopped condition (*2)
ALARM	Yellow	Alarm is detected	No Alarm
COMM ERR	Yellow	Communication error detected (*3)	Communication is functioning
FAIL	Red	FAIL detected (*4)	No FAIL

*1: The unit is not functioning properly. (e.g. due to power supply failure)
*2: The HX-S is being configured by the PC software. During the test run mode (running the simulation program), the LED blinks.
*3: Communication error: Blinking
*4: Refer to the Self Diagnosis Feature

Digital Input (DI) /Digital Output (DO) status display

The status of ON/OFF of each DIO can be displayed by the corresponding LED.



LED Name	LED Color	Lit	Unlit	Remarks
DI1 to DI12	Red	ON	OFF	
DO1 to DO11	Red	ON	OFF	ON: CLOSE
DO12	Red	ON (*1)	OFF	OFF: OPEN

*1: Refer to the Self Diagnosis Feature

Self Diagnosis

Diagnostic Result	Cause	Remarks
FAIL	•Main CPU failure •A/D converter problem •Memory error	At Fail, both DO12 and FAIL indicators are activated.
ALARM	•Control period exceeded •Computation overflow •User program error	

8. Troubleshooting

Item	Display description/ phenomena	Cause of occurrence or diagnostic description	Actions, etc.
Power supply	Power is turned ON, but no instrument status display LED lights up (blinks).	Power supply connection incorrect	Check polarity of power connection.
		Supply voltage too low	Check if supply voltage is within the rated range.
		Hardware failed	Request repair.
Ethernet	Ethernet communication cannot be linked.	Link LED (green) does not light up.	
		Cable is broken.	Replace cable.
		Hub has problem.	Replace hub with normal one.
		Link LED (green) does not blink.	
		Wire connection incorrect	Use straight connection cable (assuming a hub is used).
		Setting of IP addresses, etc. not made	Set IP addresses, etc. correctly.
		Main unit hardware failed	Request repair.
RS-232/ RS-485/ setting communication	RS-232, RS-485, or setting communication cannot be linked.	(RS-232) Connection made using straight cable	(RS-232) Use cross cable.
		(RS-485) Connection incorrect	(RS-485) Check if polarity and connection position are correct.
		PC ports incorrect	Check if cable is connected to correct port of PC.
		(RS-485) Terminator not provided	(RS-485) Check if specified terminator is attached to correct position.
		PC setting and HXS10 setting do not match.	Check if PC's communication settings and HXS10 communication settings match each other.
		(Setting communication) PC not recognizing cable	(Setting communication) Install required driver in PC.
		(RS-232/RS-485) Communication cable is broken.	(RS-232/RS-485) Check cable continuity.
		(Setting communication) Communication cable has problem.	(Setting communication) Replace communication cable.
		Main unit hardware failed	Request repair.
Digital input (DI)	No digital input is recognized.	DI status display LED does not light up.	
		Power connection for DI incorrect	DI uses external power supply system. Check connection.
		Supply voltage for DI too low	Check if supply voltage for DI is within rated range.
		Hardware failed	Request repair.
		DI status display LED is lit.	
		Hardware failed	Request repair.
Digital output (DO)	No digital output is generated.	DO status display LED does not light up.	
		DO setting incorrect	Check if DO setting is correct and if output conditions are established.
		DO status display LED is lit.	
		Power connection for DO incorrect	DO uses external power supply system. Check connection.
		Supply voltage for DO too low	Check if supply voltage for DO is within rated range.
		DO wiring incorrect	Check wiring up to DO connecting destination.
		Hardware failed	Request repair.
Pulse counter input 1, 2	Pulse counter input does not function or does not work properly.	Pulse voltage too low	Check if pulse voltage is within rated range.
		Pulse counting method setting incorrect	Check pulse counting method setting.
		Hardware failed	Request repair.
Analog input (AI)	Measured value is incorrect.	Input wiring incorrect	Check input wiring.
		Input type setting and input range do not agree with each other in voltage/standardized signal measurement.	Change settings appropriately.
		Temperature error is large or unstable in thermocouple measurement.	
		Input type setting different from connected thermocouple type	Change input type setting correctly.
		Wind blowing against terminals	Provide wind shield so that wind does not blow against terminals.
		Environmental temp. changes severely.	Attach terminal cover to terminals. Also take measures to suppress environmental temperature changes around the main unit.
		Effects of heat radiation from wiring	Do not use wire with large heat radiation effects. Cross sectional area of 0.5 mm^2 or less is recommended.
		Temperature error is large or unstable in RTD measurement.	
		Input type setting different from connected RTD type	Change input type setting to match connected RTD.
		Wiring resistance error	Use three measuring cables of the same thickness and length to ensure the same resistance between them.
		Temperature error is large or unstable.	
		Noise effect	Take measures against noise.
		Effects of signal source resistance	Lower signal source resistance by inserting converter, etc.
		Parallel connection effect	Do not make parallel connection. Set burnout setting to OFF.
		Power supply frequency effect	Set up power supply frequency in which filter setting matches the measurement object or surrounding environment.
		Hardware failed	Request repair.
Analog output (AO)	No analog output is generated. Analog output value is incorrect.	User programs not running	Check if instrument status display RUN LED (green) is lit.
		User programs incorrect	Check user programs.
		Connection wiring incorrect	Check connection wiring.
		Wiring resistance large	Check if wiring resistance is within rated range.
		CH1 and CH2 commons shared and connected	Connect CH1 and CH2 commons separately.
		Hardware failed	Request repair.

Solar Position Calculation Function

This function calculates the estimated solar position based on the latitude, longitude, current date and time, or the like, using the Solar Position Algorithm (SPA).
The solar position calculation uses the algorithm and software of the National Renewable Energy Laboratory of the United States Department of Energy.

Be sure to read the following notice about the solar position calculation software before using the product.
Beginning of use of the product represents your agreement to be bound by the terms of the notice.

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